From the GEC Archives...

The New Telegraphy

Extracts from an Interview with Signor G. Marconi

In March 1897, 'The Strand Magazine' published the text of an interview with Guglielmo Marconi by H. J. W. Dam. This interview probably took place during late 1896. As part of our tribute to Marconi, we present here some extracts from this interview, giving an interesting insight into the state of knowledge of wireless telegraphy at that time and the likely areas of application – including some quite candid comments concerning the perceived military uses to which 'The New Telegraphy' might be put. These extracts are taken from a complete copy of the article which resides in the GEC Archives.

A year has elapsed since Röntgen gave us the new photography. To-day, on the same general lines, we are confronted with something more wonderful, more important, and more revolutionary still, the New Telegraphy. After Röntgen's announcement that his rays will penetrate certain substances at short distances, comes now a young Italian to tell us that electric rays or waves, generated in a way which he has discovered, will penetrate all substances at all distances. That, generally speaking, telegraphy needs no wires, and that through walls, through houses, through towns, through mountains, and, it may possibly even happen, that through the earth, we can send despatches to any distance, the only apparatus needed being a sender and a receiver, the communication taking place by means of electric waves in the ether. ...

... The fact of induction is now one of the simplest and most common-place phenomena in the work of electricians. Edison has already used it in telegraphing to a flying railway train. Hertz, the great German investigator, developed the study of these waves, and announced, in 1888, that they penetrated wood and brick, but not metal. Strange to say, however, considering all the brilliant electricians in the more Western countries of to-day, and the enormous amount of interest in and experimental investigation of electrical phenomena therein, it has been left to a young Italian, Guglielmo Marconi to conceive what might be done with electric waves, and to invent instruments for doing it.

Marconi's story will be told with the utmost simplicity and care. But it sounds like a fairy tale, and if it had not for a background a committee of engineers representing the British Army, the British Navy, the British Post Office, and the British Lighthouse Service, which are now investigating it, it might well be doubted. As it is, the imagination loses itself, in the face of Marconi's experiments, in trying to conceive what indefinite marvels and miracles may soon be produced by the new power which has been put into human hands. ...

... Guglielmo Marconi, whose name will doubtless be often heard in the years which lie before us, is a young Anglo-Italian. He was born in Bologna, Italy, and will be twenty-three† years old next April [1897]. His father is an Italian gentleman of independent means, and his mother an Irish lady connected with several well-known English families. He is a tall, slender young man, who looks at least thirty, and has a calm, serious manner and a grave precision of speech which further give the idea of many more years than are his. He is completely modest, makes no claims whatever as a scientist and simply says that he has observed certain facts and invented instruments to meet them; but the facts and the instruments are so new, that the attention they are at present exciting is extraordinary.

This attention is largely due to the enterprise and shrewdness of Mr. W. H. Preece, the able chief of the Electrical Department of the British Postal System. Marconi's invention is a year old, but he could obtain no satisfactory recognition of it in his own country. Mr. Preece, however, had for a long time been at work upon the problem of telegraphing through the air where wires were not available. Last year the cable broke between the mainland and the Island of Mull. By setting up lines of wire opposite each other on the two coasts, he was enabled to telegraph by induction quite successfully over the water and through the air, the distance being four miles and a half. He sent and received in this way 156 messages, one of them being 120 words in length. Ordinary Morse signals were used, the despatches being carried by the ether in the air.

In a late lecture at Toynbee Hall, Mr. Preece admitted that Marconi's system, which is electrostatic, far surpassed his own, which is electro-magnetic. He expressed the fullest faith in Marconi, describing his inventions as new and beautiful, scientifically speaking, and added that he (Mr. Preece) had been instructed by the Postal

† The original text of this article gives Marconi's age as "twenty-two years old next April". As Marconi was born in 1874, the interview would clearly have had to have been carried out before April 1896 for this to be a true statement. In the light of what follows, this clearly was not so.

Department to spare no expense in testing them to the fullest degree. It will be understood, therefore, that it was due to Mr. Preece that Marconi has received the fullest recognition in England, and that engineers from different departments of the Government are now supervising his work.

Marconi was educated at Leghorn, Florence, and Bologna, and has more recently been following his special study at his home in the last-named city. He speaks English perfectly, and said, in his London home, in Westbourne Park:–

"For ten years I have been an ardent amateur student of electricity, and for two years or more have been working with electric waves on my father's estate at Bologna. I was using the Hertz waves from an apparatus, which you may photograph, a modified form of the apparatus for exciting electric waves, as used by Hertz. My work consisted mainly in endeavouring to determine how far these waves would travel in the air for signalling purposes. In September of last year [1895], working a variation of my own of this apparatus, I made a discovery."

"What was the discovery ?"

"I was sending waves through the air and getting signals at distances of a mile or thereabouts, when I discovered that the wave which went to my receiver through the air was also affecting another receiver which I had set up on the other side of a hill. In other words, the waves were going through or over the hill."

"Do you believe that the waves were going through the hill?"

"That is my present belief, but I do not wish to state it as a fact. I am not certain. The waves either went through the hill or over it. It is my belief, based on many later experiments, that they went through."

"And what was the thickness of the hill?"

"Three-quarters of a mile."

"And you could send a despatch with Morse signals through this hill or over it to someone on the other side?"

"With ease."

"What followed?"

"What followed was the conception and completion of my special invention, the instruments I have been using at Salisbury Plain in the presence of the Royal Engineers. I find that while Hertz waves have but a very limited penetrative power, another kind of waves can be exerted with same amount of energy, which waves, I am forced to believe, will penetrate anything and everything"

"What is the difference between these and the Hertz waves?"

"I don't know. I am not a professed scientist, but doubt if any scientist can yet tell. I have a vague idea that the difference lies in the form of the wave. I could tell you a little more clearly if I could give you the details of my transmitter and receiver. These are now being patented, however, and I cannot say anything about them."

"How high an alternation were you using?"

"About 250 million waves per second."

"Do these waves go further in air than Hertz waves?"

"No. Their range is apparently the same. The difference is in penetration. Hertz waves are stopped by metal and by water. These others appear to penetrate all substances with equal ease. Please remember that the amount of exciting energy is the same. The difference is in the way they are excited. My receiver will not work with the Hertz transmitter, and my transmitter will not work with the Hertz receiver. It is a new apparatus entirely. Of course, the waves have an analogy with the Hertz waves, and are excited in the same general way. But their power is entirely different. When I am at liberty to lay my apparatus and the phenomena I have observed before the scientists there may be some explanation, but I have been unable to find any as yet."

"How far have you sent a telegraphic despatch on the air?"

"With a small apparatus we have sent them a mile and three-quarters. We got results at two miles, but they were not entirely satisfactory. This was at Salisbury Plain, across a shallow valley between low hills."

"What battery were you using?"

"An eight-volt battery of three ampères, four accumulators in a box."

"Did you use a reflector?"

"Yes. It was a roughly made copper parabolic reflector with a mistake of an inch in the curve. I shall not use one in future, however. A reflector is of no value."

"Nor a lens?"

"Nor a lens."

"Why not?"

"Because the waves I speak of penetrate everything and are not reflected or refracted."

After Professor Röntgen's distances of a few yards and limitations as to substances, this was rather stunning. Marconi, however, was entirely serious and visibly in earnest in his statement.

"How far have you verified this belief?"

"Not very far, but far enough, I think, to justify the statement. Using the same battery and my transmitter and receiver, we sent and received the waves at the General Post Office Building, through seven or eight walls, over a distance of one hundred yards."

"How thick were the walls?"

"I can't say. You know the building, however. It is very solidly constructed."

"And you sent an ordinary telegraphic despatch by those signals?"

"No. We did not do that, though we could have done so. We were working with agreed signals, and we obtained the taps which we sought and repeated them till there was no room for doubt."

"Do you think that sitting in this room you could send a despatch across London to the General Post Office?"

"With instruments of the proper size and power, I have no doubt about it."

"Through all the houses?"

"Yes."

We were in a drawing room in Westbourne Park, a distance of about four and one half miles from the General Post Office.

"And how far do you think a despatch could thus be sent?"

"Twenty miles."

"Why do you limit it to twenty miles?"

"I am speaking within practical limits, and thinking of the transmitter and receiver as thus far calculated. The distance depends simply upon the amount of the exciting energy, and the dimensions of the two conductors from which the wave proceeds."

"What is the law of the intensity at a given distance?"

"The same as the law of light, inversely as the square of the distance."

This means that, whatever the energy with which the waves are sent out, their power at say 20 ft, when compared with their power at 10 ft, would be in the proportion of 10 times 10 to 20 times 20, or one-fourth in those special instances.

"Do you think they are waves of invisible light?"

"No, in some respects their action is very different."

"Then you think these waves may possibly be used for electric lighthouses when fog prevents the passage of light?"

"I think they will ultimately be so used. A constant source of electrical waves instead of a constant source of light waves, and a receiver on the vessel, would indicate the presence of the lighthouse and also its direction."

"But would not the fog interfere with the passage of the waves?"

"Not at all."

"Nor metal?"

"Nothing affects them. My experience of these waves leads me to believe that they will go through an ironclad."

"Concerning the size of the apparatus. How large is it?"

"The transmitter and receiver we have been using at Salisbury Plain and at the Post Office are each about" – he held up his hands to indicate the dimensions – "say 15 in. by 10 in. by 8 in. Small ones, effective enough for short distances, can be made of half that size."

"What are you working on at present?"

"Mr. Preece and I are working at Penarth, in Wales, to establish regular communication through the air from the shore to a lightship. This will probably be the first direction in which my apparatus is utilized, communication with the lightships. The lightships lie off this coast at any distance from half a mile to twenty miles or more."

"What length of waves have you used?"

"I have tried various lengths from 30 metres down to 10 in."

"Why would not these waves be useful in preventing the collision of ships in a fog?"

"I think they will be made use of for that purpose. Ships can be fitted with the apparatus to indicate the presence of another ship so fitted within any desired distance. As soon as two ships approach each other within that distance the alarms will ring on each ship, and the direction of the other will be indicated by an index."

"Do you limit the distance over which these waves can be sent?"

"I have no reason to do so. The peculiarity of electric waves – which was noted, I believe, by Hertz – is the distance they travel when excited by only a small amount of energy."

"Then why could you not send a despatch from here to New York, for instance?"

"I do not say that it could not be done. Please remember, however, that it is a new field, and the discussion of possibilities which may fairly be called probabilities omits obstacles and difficulties which may develop in practical working. I do not wish to be recorded as saying that anything can actually be done beyond what I have already been able to do. With regard to future developments, I am only saying what may ultimately happen; what, so far as I can now see, does not present any visible impossibilities."

"How large a station would be necessary, assuming the practicability, to send a message from here to New York?"

"A station the size of this room in a square area. I don't say how high."

The room was twenty feet square.

"What power?"

"Fifty or sixty horse power would, I think, suffice."

"What would be the cost of the two stations, completed?"

"Under ten thousand pounds, I think."

"Would the waves go through the ether in the air or through the earth?"

"I cannot say with certainty. I only believe they would go that distance and be recorded."

"You say that no lens or reflector, is of value. Then the waves would go outward in all directions to all places at the same distance as New York?"

"Yes."

"Do you think that no means will ever be found to stop this progress in all directions, and concentrate it in one direction?"

"On the contrary, I think that invention will give us that."

"Do you see any way of accomplishing this

"No. Not as yet."

"In what other directions do you expect your invention to be first utilized?"

"The first may be for military purposes, in place of the present field telegraph system. There is no reason why the commander of an army should not be able to easily communicate telegraphically with his subordinate officers without wires over any distance up to twenty miles. If my countrymen had had my instruments at Massowah, the reinforcements could have been easily summoned in time."

"Would the apparatus be bulky?"

"Not at all. A small sender and receiver would suffice."

"Then why would it not be equally useful for the admiral of a fleet in communicating with his various ships?"

"It would," said Marconi, with some hesitation.

"Is there any difficulty about that?"

"Yes," said he, very frankly, but in a way which set the writer to wondering. "I do not know that it is a difficulty yet, but it appears to be."

The writer pondered the matter for a moment. Then he asked:–

"Did you ever try exploding gunpowder by electric waves?"

"Yes."

"Could you not from this room explode a box of gunpowder placed across the street in that house yonder?"

"Yes. If I could put two wires or two plates in the powder, I could set up an induced current which would cause a spark and explode it."

"At what distance have you exploded gunpowder by means of electric waves?"

"A mile and a half. This was not directly by means of the waves. They simply upon reaching the receiver set loose a stronger current, which produced the explosion."

"But could you have exploded it by the direct action of the waves?"

"Yes. But it would, require. much more energy than I was using."

"Then if you threw electric waves upon an ironclad, and there happened to be two nails or wires or plates in the powder magazine which were in a position to set up induction, you could explode the magazine and destroy the ship?"

"Yes."

"And the electric lighthouses we are speaking of might possibly explode the magazines of ironclads as far as light from a lighthouse could be seen?"

"That is certainly a possibility. It would depend on the amount of the exciting energy."

"And the difficulty about using your instruments for fleet purposes— "

"The fear has been expressed that in using the instruments on an ironclad the waves might explode the magazine of the ship itself."

It is perhaps unnecessary to say that this statement was simply astounding. It is so much of a possibility that electric rays can be used to explode the magazine of an ironclad, that the question has already been raised by the Royal Engineers. Of all the coast defences ever dreamed of, the idea of exploding ironclads by electric waves from the shore and over distances equal to modern cannon ranges is certainly the most terrible possibility yet conceived.

Such are the astonishing statements and views of Marconi. What their effect will be remains to be seen. Considering the many able experimentalists of to-day, and their admirable and original equipments, like Tesla's dynamos, the imagination abandons as a hopeless task the attempt to conceive what – in the use of electric waves – the immediate future holds in store. The air is full of promises of miracles. Strange results appear to be coming, and coming comparatively soon....

... And, with regard to this great study of the future, perhaps no better words could be quoted as a conclusion to this article than those of Professor Lodge. He said, in closing a lecture upon a closely allied subject at the Royal Institution:–

"The present is an epoch of astounding activity in physical science. Progress is a thing of months and weeks, almost of days. The long lines of isolated ripples of past discovery seem blending into a mighty wave, on the crest of which one begins to discern some oncoming magnificent generalization. The suspense is becoming feverish, at times almost painful. One feels like a boy who has been long strumming on the silent keyboard of a deserted organ into the chest of which an unseen power begins to blow a vivifying breath. Astonished, he now finds that the touch of a finger elicits a responsive note, and he hesitates, half-delighted, half-affrighted, lest he be deafened by the chords which it seems he can now summon almost at his will."

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